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The Rural Exodus of Young Farmers and its Impact on the Shortage of Labor and Food Crop Production in Cameroon: A Computable General Equilibrium Model's Analysis

Achille Jean Jaza Folefack*

University of Dschang, Cameroon

KEYWORDS Migration. City. Village. Wage. Skilled. Unskilled

ABSTRACT Using a Computable General Equilibrium (CGE) model, this paper evaluates the impact of rural exodus on rural labor scarcity and domestic output and export of food crops in Cameroon. Model results indicate that, when 5 to 40 per cent of villagers migrate to the city, the urban unskilled labor force increases from +22.04 to +176.29 per cent. For the same rural-to-city migration rate, the domestic output of food crops falls down from -1.95 to -21.27 per cent, the export of food crops also drops down from -6.02 to -44.56 per cent, and the rural labor wage increases from +6.03 to +75.00 per cent whereas the urban unskilled labor wage rather decreases from -18.35 to -64.27 per cent. In order to limit rural exodus and its negative effects in rural areas, the government should implement policies which improve the productivity of the rural farmers such as a well improved social security system for health, a fairly land distribution, the award of credit, subsidy or higher wage for machine acquisition.

1. INTRODUCTION

Like in most developing countries, the Cameroon's economy depends mainly on agriculture. This sector contributes for 30 per cent of the Gross Domestic Product and 60 per cent of exported revenues. About 60 per cent of the country's population still lives in the rural areas with agriculture being their main occupation (Ministry of Agriculture 2014). However, the State disengagement and liberalization policy implemented in the agricultural sector from the early 1990s led to the removal of most subsidies from the agriculture (Defranc 1995; Nchare 2002). Still under trade liberalization, the cancellation of the main import tariff/non-tariff barriers has further engendered a market competition between the imported commodities and local production giving rise to lower profit gained by rural farmers.

Progressively, the young farmers are discouraged by the less rewarding rural farming activities and prefer to migrate to the city to improve their living conditions. Their movement commonly known as "rural exodus" implies their displacement from the rural areas (villages) towards the cities in the search of well-being. Hence, the current urban population growth of about 5 per cent per year in the main Cameroonian cities (Yaoundé, Douala, Bafoussam, Garoua, etc.) is particularly attributed to the rural exodus which accounts for a rate of about 2.8 per cent per year (Ministry of Plan 2014; Ministry of Agriculture 2014; Nanhou 1998).

This rural exodus mainly affected the young people between 15 to 35 years of age. This age group accounts for 30.3 per cent of the total population of Cameroon, but over 36 per cent of these young people are strongly hit by poverty which is the main factor encouraging their movement from the village to the city leaving, thereby, only the older people in the village (Ministry of Plan 2014; Emini et al. 2005).

The average age of farmers residing in the rural areas (villages) which was 31 years during the early 1990s has regretfully increased to 40 years nowadays (Ministry of Plan 2014). The rural exodus is the main factor which explained this increasing mean age over the years of farmers living in the villages (Ministry of Agriculture 2014). As a matter of fact, with time, more and more young farmers are leaving the village towards the city to look for new job opportunities or working alternatives. The fact that agriculture is less rewarding than other sectors encouraged young people to further, migrate to the city where they hope to find better working conditions or well paid jobs.

For instance, one day (8 hours) of manual labor done by a person working in the rural farm-

*Address for correspondence:
Dr. Jaza Folefack Achille Jean
University of Dschang
P.O. Box 31535
Yaoundé, Cameroon
Telephone: (237) 695.84.42.05
E-mail: ajazafol@yahoo.fr

ing sector is worth at about 1500 FCFA (2.29 Euros) which is the equivalent cost of one single hour of job in the urban sectors of industry, service or urban agriculture (Ministry of Agriculture 2014). At such higher wage rate associated with luxury leisure activities that they hope to find in the vicinity of urban areas, young farmers are attracted to migrate to the city. Other young farmers would also like to settle down in their native village but are discouraged by the land scarcity problem in rural areas. Thus, their migration to the city is in the hope to find alternative jobs in the new place of residence.

However, in the urban areas, it is also not so easy to get any job since the youth unemployment rate stands at over 20 per cent, compared to over 5 per cent in rural areas (Ministry of Plan 2014; World Bank 2014). This high unemployment rate in cities, apart from the rural exodus, is also due to the decline in the number of jobs available in the modern sectors of industry and service. Further, up to 40 per cent of the rural inhabitants are illiterate persons who never receive any basic training or formal education (Ministry of Plan 2014; World Bank 2014).Thus, at their arrival in the urban areas, it is expected that they will offer only the unskilled labor to the job market. Hence, once at the city, the migrated rural labor force becomesthe urban unskilled laborers which in 70 per cent of cases would work into the small jobs of the informal sector (Jaza Folefack 2005). Alternatively, the remaining 30 per cent of migrants would receive training and enters into competition with the urban skilled labor at the city (Ministry of Agriculture 2014).

Remarkably, about 85 per cent of the newly arrived unskilled migrants originate from very poor families (Emini et al. 2005; Nanhou 1998; Ekpenyong 1984; Zhu and Luo 2010). So, their dependants (wife, children, friends, relatives, etc.) who remained in the villages are also counting on them to earn their life (Ministry of Agriculture 2014). Thus, the urgent challenge for the new migrants is to struggle to seek an employment in order to survive in the city while helping their relatives in the village.

According to the Ministry of Plan (2014), more than 80 per cent of the newly arrived migrants remains unemployed within 6 to 9 months after their migration at the city, although, they are fighting every day to enter into the job market or to seek a new working place. Generally, the facility/probability to quickly find a job at the city depends on several factors among which the luck, friendship, or mentorship by a relative or well positioned civil servant in the administration/government who can recommend/sponsor the migrant in the search of an employment. In any case, for the new migrant, seeking an employment at the city is not an easy task and needs a lot of patience (Ministry of Agriculture 2014).

Consequently, the rural exodus brings two simultaneous issues in both extremes of the way (that is, rural areas and city):

(1)-On the one hand, in the rural areas, there is a gap created through the abandoned agricultural activities by young farmers who left the villages. Thus, one observes a drop in the food crop production as well as an economic and social disruption caused by the rapid displacement of workers from agriculture in rural areas (Bhasin 2008).

(2)-On the other side, at the city, there is employment in security and, thus, a doubt whether the new migrants, once arrived at the city, will easily get a job to survive, help relatives in villages or contribute to the development of their rural areas and even to the development of the country.

Objectives

The main objective of the study is to evaluate the impact of rural exodus on rural labor scarcity and domestic output and export of food crops in Cameroon. More specifically, the paper seeks to:

(i) Assess the effect of rural exodus of young farmers on rural labor scarcity and domestic output and exports of food crops.
(ii) Examine solutions and suggest recommendations to government in order to face the shortage of rural labor and food crops created by the rural-to-city migration of villagers.

MATERIAL AND METHODS

Model Choice and Literature Review

Addressing the above rural exodus questions in relation to the agricultural sector are in the hands of policy makers. On their side, policy makers depend on models for the simulation or analysis of policies. Those analyses extend from

partial equilibrium to general equilibrium models.

A partial equilibrium model consisted of a greater number of commodities within the agricultural sector and, thus, considers the effect on more specific agricultural products, but it failed to measure the simultaneous impacts in other sectors of the economy. A Computable General Equilibrium (CGE) model however, covers all sectors of the economy and can in this respect measure the effect of agriculture connected to other sectors (Hazell and Norton 1986; Bauer and Kasnakoglu 1990).

The CGE models are generally required to understand the linkages between macroeconomic shocks and their impacts at the micro-level. They are preferred to the partial equilibrium models because they can explain the inter-linkages among the various sectors of the economy.

Since the last few decades, a number of empirical studies have been done to analyze and evaluate the impacts of various policies in the agricultural sector in developing countries. Those studies have constructed various models by employing a mathematical programming approach and namely the linear, non-linear programming or CGE models (Hazell and Norton 1986; Bauer and Kasnakoglu 1990).

In Cameroon, many previous studies have also employed a mathematical programming approach and were based namely on the CGE models covering all sectors of the economy. For instance, Condon et al. (1987) and Devarajan and Rodrik (1989) have constructed and applied CGE models for Cameroon using NLP (Non-Linear Programming), CNS (Constrained Nonlinear System), MCP (Mixed Complementary Programming) and MPSGE (Mathematical Programming System for General Equilibrium analysis). In the same line, Njinkeu and Bamou (2002) simulated with a CGE model for Cameroon the trade and exchange rate policy options for the countries of the CFA Franc zone whereas Thiele and Wiebelt (1993) have also used a CGE model for explaining the causes of over exploitation and depletion of rain forests in Cameroon. Recently, thanks to an update CGE model for Cameroon, Djiofack (2008) analyzed the effect of the trade liberalization on the telecommunication services in Cameroon.

However, none of the previous CGE models of Cameroon was used to analyze the impact of rural exodus on the food crop sector. Hence, this study covers this gap by evaluating the impact of rural exodus of young farmers on the food crop production (domestic output/sales, export, producer price, etc.) and labor shortage in rural areas. For this reason, a CGE model for Cameroon is used in this paper.

Model Description and Verbal Presentation

In the present research, the impact of rural exodus of young farmers on the food crop sector is analyzed by using a Cameroon's CGE model initially constructed by Condon et al. (1987) which was recently updated by Emini and World Bank (2004).The main features/characteristics of this CGE model are the followings (Emini and World Bank 2004):

- 11 economic sectors with 9 tradable and 2 non-tradable. The 9 tradable sectors of the model are: food crops, cash crops, forestry, food processing, consumer goods, intermediate goods, construction materials, capital goods and private services. Construction and public services are the 2 non-tradable sectors of the model.
- 3 labor categories with differentiated wages which are the: rural, urban unskilled and urban skilled labor categories. It should be noted, however, thatlabor is mobile across sectors. That means that the same labor wage/ salary rate is paid for each sector. The model also assumed that, this labormay or may not be fully employed.
- Capital is fixed in the model.
- Institutions are the households and government.
- The goods produced are consumed domestically and one part is exported. Domestic sales and exports are assumed to be imperfect substitutes and the function which transforms domestic sales and exports is called the Constant Elasticity of Transformation (CET) function (Devarajan et al.1997; Sadoulet and De Janvry 1995).
- Model data are organised in the form of a Social Accounting Matrix (SAM)which was recently constructed by Emini and World Bank (2004).

Mathematical Presentation of the Model

The Cameroon's CGE model from Emini and World Bank (2004) contains a huge number of equations and all of them cannot be presented

within an article (because of the number of pages' limitation). Hence, this section presents only those mathematical equations which are of great interest in relation to our topic and namely the production and input demand functions, Constant Elasticity of Transformation (CET) function and the producer price function.

Production and Input Demand Functions

In defining production technology, the Constant Elasticity of Substitution (CES) production function is used in our CGE model. The production of goods and services is considered by a set of sectors and it is assumed that each sector produces a single good/service. The sector account receives revenues from selling the good/service and pays for intermediate inputs and wages (rents) to primary factors.

The production system is considered in two steps: at the first step, labor and capital are combined to produce value-added and at the second step, value-added and composite intermediates are re-combined for domestic output (Sadoulet and De Janvry1995). The production function is therefore specified as:

$$X_i = \beta_{xi}.\left[\propto_{vi}.VA_i^{-\rho_i^p} + (1-\propto_{vi}).IN_i^{-\rho_i^p}\right]^{-1/\rho_i^p} \quad (1)$$

Where: i stands for sector, X_i is the sectoral output, VA_i is the sectoral value-added, IN_i is the sectoral composite intermediate, is a shift parameter and $\rho_i^p = \left(\frac{1}{\sigma_i^p}\right) - 1$ is the share parameter for value-added and, with standing for elasticity for substitution between $VA_i$and IN_i.

Similarly, another CES production function is used to combine labor and capital for value-added and is specified in the following function as:

(2)

Where: L_i is labor, is capital, is a shift parameter, is the labor share parameter and with stands for elasticity of substitution between labor and capital.

The producers are profit maximizers and the factor demand functions can be derived from the first order condition for maximization of profit function subject to the CES production function. Accordingly, the value-added demand function takes the form:

(3)

Where: PN_i is composite intermediate input price at the sector level, PV_i is value-added price; other notations are as specified earlier.

Similarly, the labor demand function can be expressed as:

(4)

Where: and are sectoral wage and wage proportionality factors, respectively; is the price of capital goods in sector i; other notations are as specified earlier.

Constant Elasticity of Transformation (CET) and Export Supply Functions

The imperfect transformability between domestic sales D_i and exports E_i is considered in a Constant Elasticity of Transformation (CET) function (also named as output transformation function). The CET function is specified as:

(5)

Where: E_i is sectoral exports, D_i issectoral domestic sales; and are shift and share parameters, respectively and elasticity of transformation is given by

For the CET function, E_i and D_i are considered as outputs. The optimal combination of domestic sales and exports is expressed through the export supply function as:

(6)

Where: is the elasticity of transformation between domestic output sold domestically and exports.

Producer Price Function

The sales or activity price for producer is composed of domestic price of domestic sales and the domestic price of exports. It is mathematically expressed as:

(7)

Where: PX_i is the producer price, PD_i is the price of domestically produced goods sold in

the domestic market, PE_i is the domestic price of export; other notations are as specified earlier.

Scenarios Specification

In this paper, the main scenariosrun in the Cameroon's CGE model is: an increase in the rate of rural exodus by 5 per cent, 10 per cent, 15 per cent, 20 per cent, 25 per cent, 30 per cent, 35 per cent and 40 per cent, respectively. In these scenarios, we will simulate the effect of rural exodus on the labor use, labor wage and domestic output and exports of food crops'sector.

This CGE model is solved in *General Algebraic Modeling System* (GAMS) software which is in the Mixed Complementarity (MCP) form. The effect of a X per cent rate of rural exodus was put into the model by typing the commands written in the GAMSsyntax as follows:

ls.fx('Rural')=(100-X)* sum(i,xle(i,'Rural'));

(8) ls.fx ('Urbanunskill') =sum (i,xle (i, 'Urbanunskill')) + X*sum(i,xle(i,'Rural'); (9)

Where: i stands for sector; ls is labor supply; xle is the employment by sector and labor category; 'Rural' and 'Urban unskill' stand for the rural and urban unskilled labor categories, respectively; fx denotes fixed in GAMS syntax.

From these commands, the simulated model results are displayed in absolute terms. However, in order to better interpret them,they areconverted into relative valuesY (percentage of change compared to the base run) by using the following formula:

$$Y = \frac{(Simulated\ Results)*100}{Base\ Run\ Results} - 100 \quad (10)$$

Even before the various scenarios were run, the model was validated and it was found that the baseline optimal solution from the model exactly displayed the field data with regards to the labor use, labor wage and food crops' output.

RESULTS AND DISCUSSION

Effect of the Rural Exodus on the Total Labor Use

The simulated results of the impact of the rural exodus on the total labor force (that is the total availablelabor after the migration has occurred) are presented in Table 1. The Table shows that, as more villagers migrate to the city, the urban unskilled labor force increases. The increase is, however, more rapid than the rural exodus' rate. At a constant rural-to-city migration rate, one observes that the urban unskilled labor force increases at an increasing rate. More precisely, when the rate of rural exodus is increased by 5 per cent, 10 per cent, 15 per cent, 20 per cent, 25 per cent, 30 per cent, 35 per cent and 40 per cent, then the urban unskilled labor would be increased by +22.04 per cent, +44.07 per cent, +66.11 per cent, +88.15 per cent, +110.18 per cent, +132.22 per cent, +154.26 per cent and +176.29 per cent, respectively (see Table 1).

As earlier mentioned,the majority (about 60%) of the Cameroon's population lives in the rural areas (Ministry of Agriculture 2014; World Bank 2014). Knowing that the unskilled labor force is a small part of the 40 per cent people living in the city, its higher increase from the rural exodus effect could be attributed to this smaller proportion.

Obviously, the urban skilled laborremains unchanged (constantly at 0.00 per cent) for all the rates of rural exodus (see Table 1). This tendency results from formula (8) and (9) introduced into the model, and which state that, the rural people who newly arrive at the city would entirely become the unskilled labor with none person working as skilled labor.

Effect of Rural Exodus on the Wage of Different Labor Categories

WageVariation of Rural Population

In rural areas, the labor supply is fixed and assumed to be perfectly inelastic. In Figure 1, an increase of the rural exodus' rate implies a decrease of the labor supply quantity from Q_1 to Q_2, or simply is a shift of the labor supply curve from S_1 to S_2.This shift in its turn will lead to a movement of the intersection/equilibrium point of the demand (D) and supply (S) curves and therefore, the wage will increase from W_1 to W_2.

Table 1: Impact of an increase of the rural exodus' rate on the variation (in %) of the total labor force by category

Labor category	*5% exodus*	*10% exodus*	*15% exodus*	*20% exodus*	*25% exodus*	*30% exodus*	*35% exodus*	*40% exodus*
Rural	-5.00	-10.00	-15.00	-20.00	-25.00	-30.00	-35.00	-40.00
Urban unskilled	+22.04	+44.07	+66.11	+88.15	+110.18	+132.22	+154.26	+176.29
Urban skilled	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Source: CGE model results

In Table 2, the effect of the rural exodus on the variation of wage gained by the rural population is shown. From the Table, one observes that the"rural labor category" gains higher wage when more people move to the city. More specifically, when the rural exodus' rate is increased by 5 per cent, 10 per cent, 15 per cent, 20 per cent, 25 per cent, 30 per cent, 35 per cent and 40 per cent, then the wage for the "rural labor category" would be increased by +6.03 per cent, +12.66 per cent, +20.03 per cent, +28.29 per cent, +37.63 per cent, +48.30per cent, +60.62% and +75.00%, respectively (see Table 2).The explaining reason could be that, the rural-to-city migration of villagers would bring a shortage of labor in such a way that, the supply of labor is less than its demand in the rural areas. Since a proportion of rural labor force has moved/migrated to the city, those workers remaining in the village will claim for higher remuneration and then, their wage will increase (see Fig. 1). This rural wage increase is, however, beneficial to those members of poor peasantry who did not migrate (preferring to stay at the village), or have not yet join the stream of migrants. They will benefit from an increase of their income/living standard resulting from the more rewarding salary rate paid in the rural farming sector.

In its base-run, this CGE model assumes the same wage rate for each sector of the economy. This explains why in the simulated results, for a given rural exodus' rate, the wage variation is also the same for each of the 11 sectors of the model (food crops, cash crops, forestry, food processing, consumer goods, intermediate goods, construction materials, capital goods, construction, private services, and public services).

Theoretically, no matter whether there is rural exodus or not, the country needs the same quantity of food crop to be produced in order to feed its entire population. However, since this food crop is entirely produced in the rural areas, labor forceis needed to work in the rural farms. Unfortunately, because of the rural exodus, the supply of rural labor is reduced while the demand of labor is kept constant in villages. Hence, the wage of rural labor would increase (see Fig. 1).

Another example on a food crop such as green beans commonly produced in Cameroon is also illustrative. When green beans are already mature, a large number of people/laborersareurgently needed to harvest them otherwise they will perish on the farm. When there is the migration of laborers to the city, the green beans' land size in the following cropping years is still the same, meaning that the same labor force is needed during the harvesting period. But, since there are only less people (thus less laborers) residing in the village, those workerswho remain in the village are so much solicited to harvest in the plantations. They will refuse low salary/wage forcing thereby the farms' owners to employ/pay them at a higher wage.

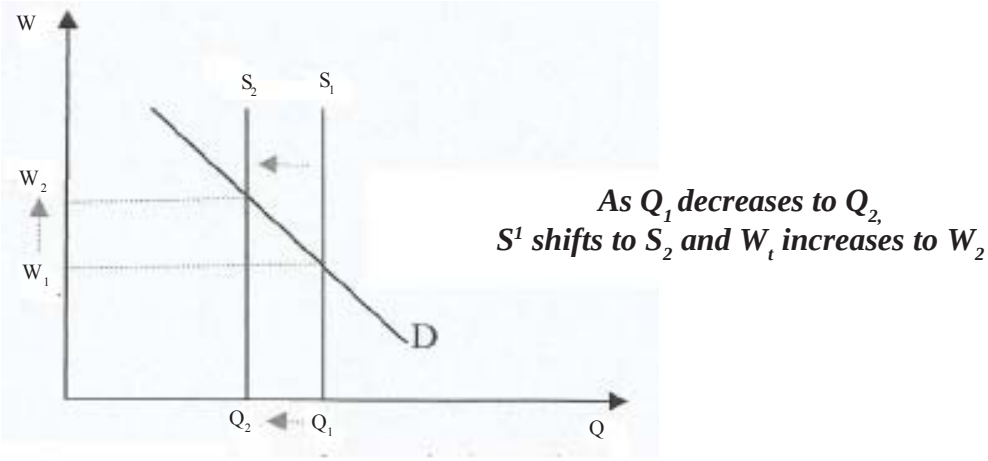

Fig. 1. Effect of the increase of the labour productivty on the domestic sales (D) and exports (E) of food crops in output (CET) transformation function
Source: Author's representation

Wage Variation of Urban Unskilled Population

As earlier mentioned, the migrants to the city are mainly illiterate farmers offering unskilled labor at the job market (Ministry of Agriculture 2014; World Bank 2014). Hence, their arrival at the city will create an excess of the unskilled labor supply. In the new situation, we then have two sub-categories of the unskilled laborsupply: the unskilled who previously/permanently reside at the city and the newly arrived unskilled labor. The two sub-categories will both give an excess supply of unskilled labor at the city and in this case, the total supply of unskilled labor at the city is higher than its demand. Thus, the urban unskilled wage would decrease as stipulated by the standard demand and supply economic theory.

In the city, the unskilled labor supply is fixed and assumed to be perfectly inelastic. As illustrated graphically (Fig. 2), an increase of the rural exodus' rate implies an increase of the unskilled labor supply quantity from Q_1 to Q_2, or simply is a shift of the labor supply curve from S_1 to S_2. This shift in its turn will lead to a movement of the intersection/equilibrium pointof the demand (D) and supply (S) curves and, therefore, the wage for unskilled labor will decrease from W_1 to W_2.

In Table 2, one observes that, the wage rate for the "urban unskilled labor" category strongly decreases as more farmers are migrating to the city. More precisely, when the rate of rural exodus is increased by 5 per cent, 10 per cent, 15 per cent, 20 per cent, 25 per cent, 30 per cent, 35 per cent and 40 per cent, then the wage for the "urban unskilled labor category" decreases by -18.35 per cent, -31.02 per cent, -40.29 per cent, -47.37 per cent, -52.94 per cent, -57.44 per cent, -61.16 per cent and -64.27 per cent, respectively (see Table 2). This simply implied that,the more villagers leave rural areas, the more we have migrants settled at the city, and the more we would have excess of the unskilled labor at the city and thus, the wage rate would more and more decrease for this labor category.

Table 2: Impact of an increase of the rate of rural exodus on the wage variation (in %) by labor category

Labor category	*5% exodus*	*10% exodus*	*15% exodus*	*20% exodus*	*25% exodus*	*30% exodus*	*35% exodus*	*40% exodus*
Rural	+6.03	+12.66	+20.03	+28.29	+37.63	+48.30	+60.62	+75.00
Urban unskilled	-18.35	-31.02	-40.29	-47.37	-52.94	-57.44	-61.16	-64.27
Urban skilled	-0.87	-1.60	-2.21	-2.76	-3.26	-3.72	-4.16	-4.59

Source: CGE model results

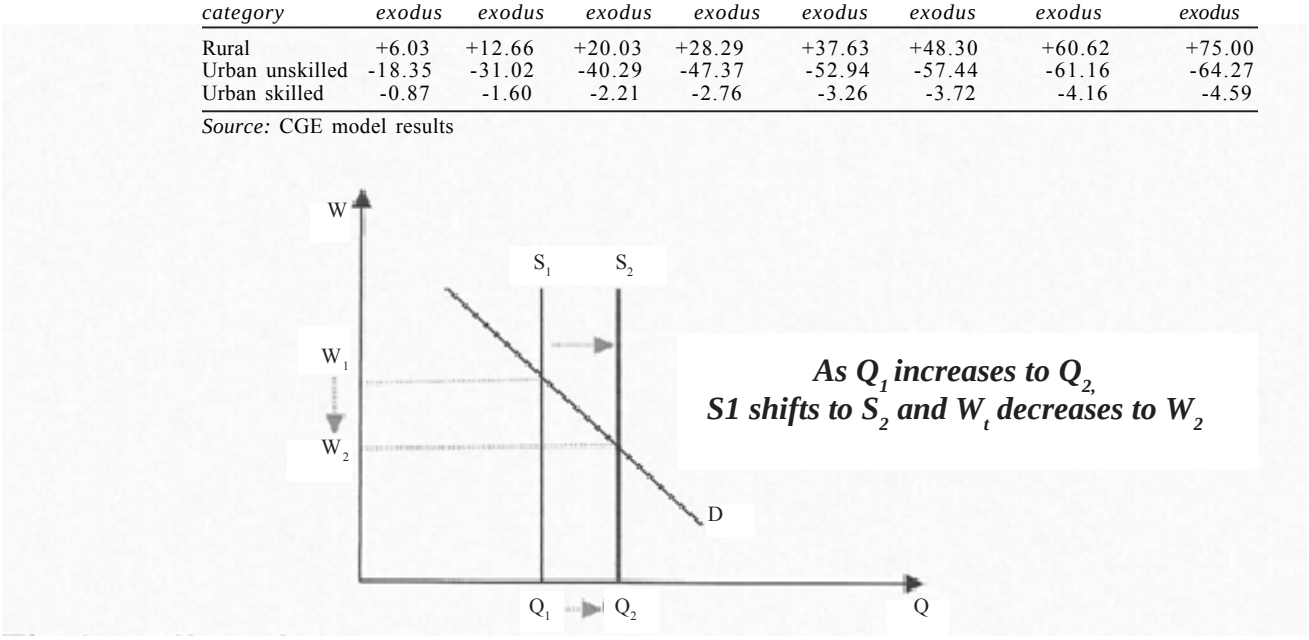

Fig. 2. Effect of the rural exodus on the variation of wage gained by the urban unskilled population
Source: Author's representation

Wage Variation of Urban Skilled Population

The newly arrived migrants at the city will face a competition with those skilled people who are already permanent resident at the city. The competition is created by the fact that, some new migrants, once arrived at the city (although unskilled at the beginning) will receive training in order to become skilled labor. After the training, they become rival/concurrent of the permanent resident's skilled labor. In the new situation, there is excess of skilled labor indicating that, the total supply of skilled laboris greater than its demand and thus, the wage for the urban skilled labor would decrease.

In the city, the skilled labor supply is fixed and assumed to be perfectly inelastic. As illustrated graphically (Fig. 3), an increase of the rural exodus' rate implies an increase of the skilled labor supply quantity from Q_1 to Q_2, or simply is a shift of the labor supply curve from S_1 to S_2. This shift in its turn will lead to a movement of the intersection/equilibrium point of the demand (D) and supply (S) curves and, therefore, the wage for skilled labor will decrease from W_1 to W_2.

The computed figures of Table 2 indicate that, when the rate of rural exodus is increased by 5 per cent, 10 per cent, 15 per cent, 20 per cent, 25 per cent, 30 per cent, 35 per cent and 40 per cent, then the wage for the "urban skilled labor category" is decreased by -0.87 per cent, -1.60 per cent, -2.21 per cent, -2.76 per cent, -3.26 per cent, -3.72 per cent, -4.16 per cent and -4.59 per cent, respectively (see Table 2). This "wage decrease" can be explained by the fact that, once the new migrants receive training and become qualified workers at the city; they would tend to easily accept lower salary because they are comparing it to the lower or no wage situation they faced during their village-stay.

From the model results, the lower wage received by the urban skilled peoplecanalso be explained by the drop of the government revenue and expenditure. The more we have higher rural exodus rate, the more and more the country's economy will lose mainly because the activities and money earned by migrants is usually channeled in a more informal way (Nanhou 1998; Ekpenyong 1984). Channeling money through informal way implies a drop in government revenue which in its turn stimulates the State authorities to spend less money on paying its civil servants (represented by the urban skilled labor in this case).

Impact of the Rural Exodus on the Production of Food Crops

This CGE model also helps us to measure the impact of the rural exodus on the production of food crops. This effect is measured by varying the rural exodus rate and observing the changes on the domestic output/sales and exports.This section presents the details of these changes.

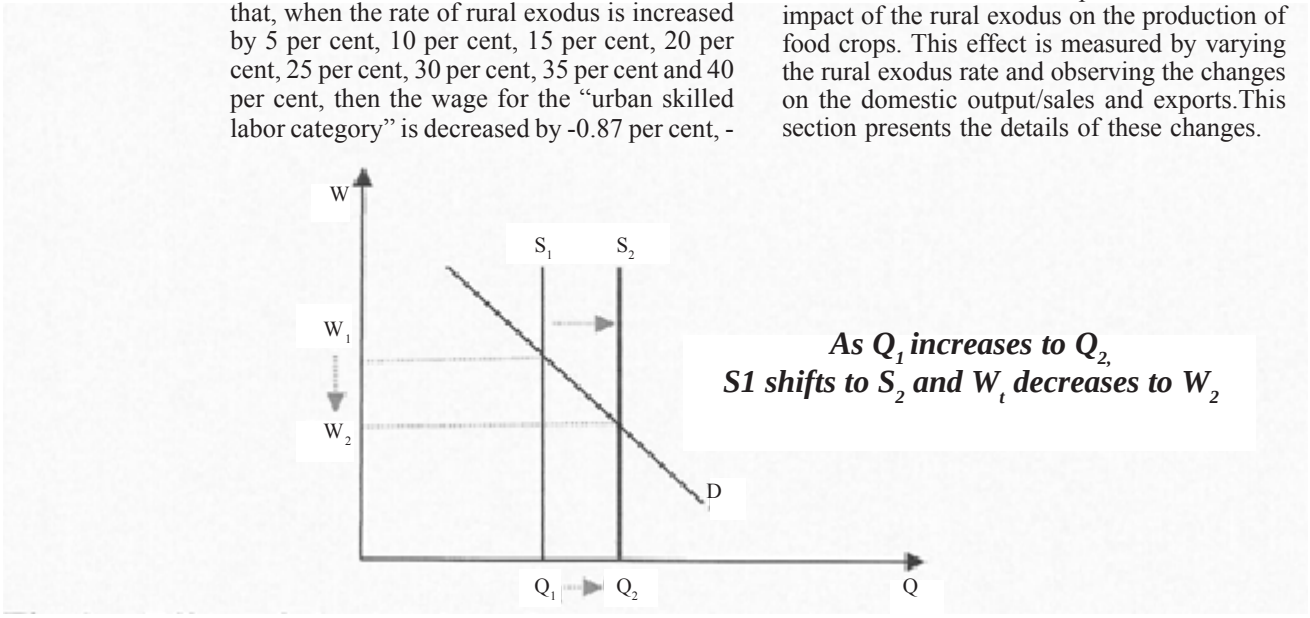

Fig. 3. Effect of the rural exodus on the variation of wage gained by the urban skilled population
Source: Author's representation

Impact on the Domestic Output/Sales and Exports of Food Crops

Using an output (CET) transformation function, the simultaneous changes of the domestic output/sales and exports of food crops resulting from the rural exodus is evaluated. Because of the rural exodus, the domestic sales as well as exports of food crops drop down, and there is a shift or movement of the output (CET) transformation function inwards (see Fig. 4). This Figure explained that, before the migration, we are on CET_0 output transformation function and thus, the given the available labor is L_0 which can be used in order to produce a combination of D_0 domestic sales and E_0 exports. Now that the rural labor resource as dropped from L_0 to L_1 (as a result of the rural exodus), we are currently on CET_1output transformation function, and then the new possible crop's output combination to produce becomes D_1 domestic sales and E_1 exports (see Fig. 4).

The simulated results of Table 3 suggest that, when the rate of rural exodus is increased by 5 per cent, 10 per cent, 15 per cent, 20 per cent, 25 per cent, 30 per cent, 35 per cent and 40 per cent, then the domestic output of food crops would be decreased by -1.95 per cent, -4.16 per cent, -6.58 per cent, -9.19 per cent, -11.96 per cent, -14.91 per cent, -18.01 per cent and -21.27 per cent, respectively. Similarly, for the same rural-to-city migration rates, the domestic sales of food crops are decreased by -1.90%, -4.05 per cent, -6.43 per cent, -8.99 per cent, -11.73 per cent, -14.64 per cent, -17.71 per cent and -20.95 per cent, respectively. And likewise, still at the same migration rates, the exports of food crops are decreased by -6.02 per cent, -11.84 per cent, -17.51 per cent, -23.07 per cent, -28.55 per cent, -33.95 per cent, -39.29 per cent and -44.56 per cent, respectively.

Interpretation of Computed Results from the Labor Production Elasticities

The decreasing trend of domestic output of food crops can better be understood by comparing the labor production elasticities between

Table 3: Impact of an increase of rural exodus rate on the variation (in %) of domestic output, domestic sales and exports of food crops

Labor category	*5% exodus*	*10% exodus*	*15% exodus*	*20% exodus*	*25% exodus*	*30% exodus*	*35% exodus*	*40% exodus*
Domestic output	-1.95	-4.16	-6.58	-9.19	-11.96	-14.91	-18.01	-21.27
Domestic sales	-1.90	-4.05	-6.43	-8.99	-11.73	-14.64	-17.71	-20.95
Exports	-6.02	-11.84	-17.51	-23.07	-28.55	-33.95	-39.29	-44.56

Source: CGE model results

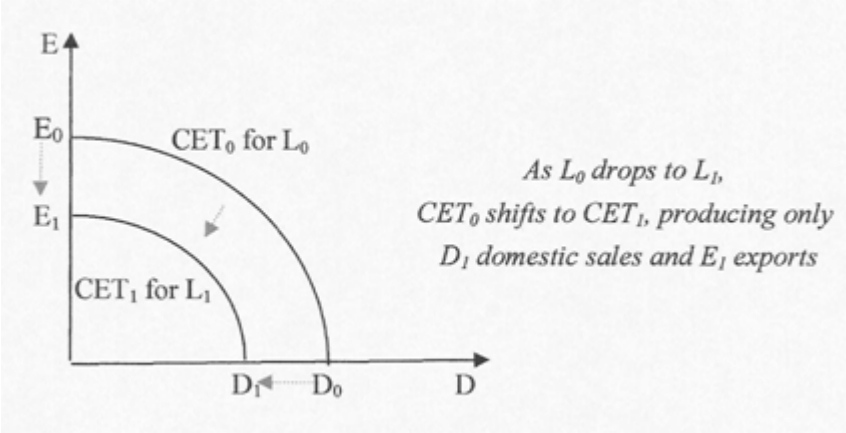

Fig. 4. Output (CET) transformation function showing the rural exodus effect on the domestic sales (D) and exports (E) of food crops
Source: Author's representation

Table 4: Labor production elasticities (unity) from Cobb-Douglas production function

Labor category sector	*Rural (Village)*	*Urban unskilled (City)*	*Urban skilled (City)*
Food crops	0.592	0.058	-

Source: Data from CGE model

rural population (0.592) and urban-unskilled people in the city (0.058) (see Table 4).

The figures in Table 4 indicated that, for the food crop sector, the labor production elasticity of rural population (0.592) is higher than that of the urban unskilled people (0.058). Their interpretation is that (Table 5), a 1 per cent decrease of labor (as provoked by the migration of 1 per cent people) would lead to a decrease by 0.592 per cent of food crops' output in rural areas. This 1 per cent labor force will move to the city and their arrival in the urban area would lead to an increase in the food crop output by only 0.058 per cent (see Table 5). Thus, for the food crop sector, the labor is more productive in rural areas than in the city.

Since the food crops are mainly cultivated in rural areas and rarely in the city, this explains why a decrease of labor in rural areas will tend to affect much more the food crop sector. From Table 5, one can similarly interpret the results for other rural exodus' rates. Comparing Tables 3 and 5 altogether, one can easily see that, at each rural exodus rate, the percentage of crop decrease by using the production elasticity in-

Table 5: Effect of the labor production elasticities (å) on the variation of food crops' output in rural areas and city

Labor category	*1% exodus*	*5% exodus*	*10% exodus*	*15% exodus*	*20% exodus*	*25% exodus*	*30% exodus*	*35% exodus*	*40% exodus*
Output decrease (%) in villages	-0.592	-2.96	-5.92	-8.88	-11.84	-14.80	-17.76	-20.72	-23.68
Output increase (%) in city	+0.058	+0.29	+0.58	+0.87	+1.16	+1.45	+1.74	+2.03	+2.32

Notes:

(i) The output change at X% exodus'rate is equal to: å*X; where: å is the labor production elasticity.

(ii) In rural areas (villages), the labor production elasticity å is 0.592; Thus, the food crop output decrease at a rate X of 5% exodus is: å*X=0.592*5=2.96; at a rate X of 10% exodus is: å*X=0.592*10=5.92 and so on.

(iii) At the city, the labor production elasticity å is 0.058; Thus, the food crop output increase at a rate X of 5% exodus is: å*X=0.058*5=0.29; at a rate X of 10% exodus is: å*X=0.058*10=0.58 and so on.

Source: Author'smanual computation

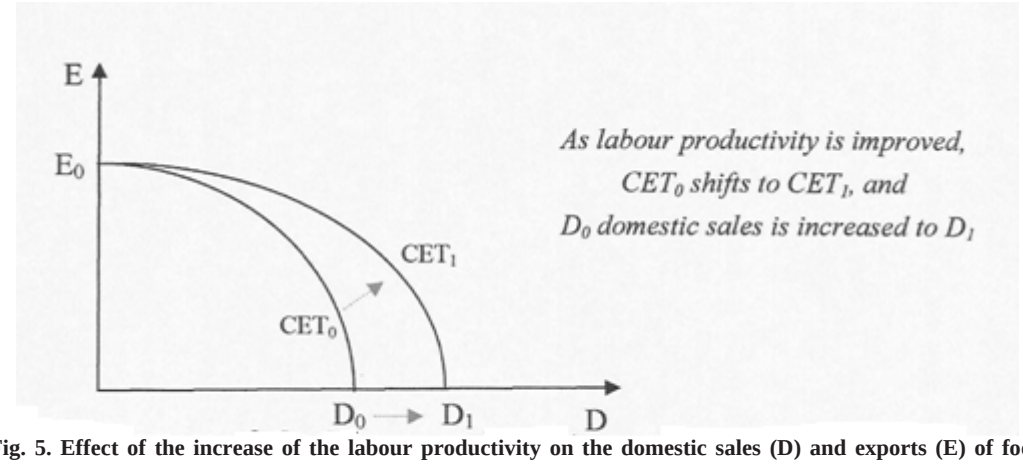

Fig. 5. Effect of the increase of the labour productivity on the domestic sales (D) and exports (E) of food crops in output (CET) transformation function

Source: Author's representation

terpretation is very similar to the decrease of the domestic output in rural areas as computed by the model (see Table 3). This proves that, the decreasing trend of food crop output depends mainly on the labor production elasticities entered into the model.

Interpretation of Computed Results from the Field Reality

The field reality also testifies well a drop in the output of food crops due to the rural-to-city migration of villagers. The reasons explaining these arguments are that:

(a) A rural exodus rate of X per cent implies that, one part (X%) of the rural population has moved to the city and a proportion of only 100-X% of non-migrants would remain in the village. This means that, the labor supply is reduced by X% in the village. The rural labor shortage/scarcity implies that, less labor force would stay in the village to produce food crops and thus, less parcels of land would be cultivated in the rural areas. The possible explanation is that, when migrants are moving to the city, their lands are left in fallow and thus there is a reduction of the land acreage under cultivation in the village. Hence, the total output received from the cultivated land will be lower than before.

(b) Further, mostly young men (15 to 35 years of age) migrate to the city and women *plus* old persons (above 65 years of age) remain in the village. Normally, the clearing of trees on land is a heavy task devoted to young men. Since old persons or women cannot clear land during the absence of their husbands, the same land parcels are cultivated without fallow over several cycles of production and become infertile/unproductive over the time. This could lead to a drop of total output from the land (Ekpenyong 1984).

This decrease in the output in its turn provokes a shortage/scarcity of food crop. In this way, the supply of food crop is decreased while its demand is kept constant. Consequently, the producer price would increase and this is mainly beneficial for the members of the poor peasantry who did not migrate (preferring to stay at the village), or who have not yet join the stream of migrants. The model results confirm this argument and the simulated figures indicate that, when the rate of rural exodus is increased by 5 per cent, 10 per cent, 15 per cent, 20 per cent, 25 per cent, 30 per cent, 35 per cent and 40 per cent, then the producer price of food crop would increase by +2.40 per cent, +5.21 per cent, +8.44 per cent, +12.12 per cent, +16.29 per cent, +21.04 per cent, +26.45 per cent and +32.67 per cent, respectively.

Increase of Labor Productivity to Offset the Drop of Food Crop and Exports

To offset the output decrease in food crop sector (see Table 3), the model, however, suggested that we should increase the labor productivity of the rural population. As shown in Figure 5, if the farmers' working conditions are improved (availability of modern machines, technological advance in agricultural mechanization, health security of farmers, etc.), one can expect that the amount of workload performed from each hour of a worker's time is improved (that is, labor productivity is improved) and thus the amount of food crops produced is increased. Graphically represented (Fig. 5), the output (CET) transformation function shifts outwards from CET_0 to CET_1 with the domestic sales increasing from D_0 to D_1 and the exports remaining constant at E_0.

CONCLUSION

Occurring at a rate of about 2.8 percent per year, the rural exodus is currently one of the main challenging rural development issues in Cameroon. Young farmers between 15 to 35 years of age, who accounts for 30.3 per cent out of 60 per cent of the rural laborforce, are strongly hit by this phenomenon in a country where agriculture constitutes the principal engine for economic growth (contributing for 30 per cent of the Gross Domestic Product and 60 per cent of exported revenues). Thus, using a Computable General Equilibrium (CGE) model for Cameroon, this paper analyzed the impact of the rural exodus of young farmers on the shortage of rural labor and food crop production of the country.

The study assumes that, the rural people become unskilled in most cases at their arrival in the city. The simulated model results show that, the urban unskilled population grows at a more rapid percentagethan the rural exodus rate. More precisely, when 5 to 40 per cent of villagers migrate to the city, the urban unskilled people are increased from +22.04 to +176.29 per cent. In reality, the majority (about 60%) of the Cameroon's population lives in the rural areas as compared to only 40 per cent of cities' residents and this tends to justify why the rural exodus would bring higher percentage of population increase in the city.

As indicated by the model results, the rural exodus created a labor shortage in rural areas leading to an increase in wage gained by rural inhabitants who did not migrate and to a drop down in the salary of the urban unskilled and urban skilled population. When the rate of rural exodus is increased from 5 to 40 per cent, the rural labor wage is improved from +6.03 to +75.00 percent. Still when 5 to 40 per cent of villagers migrate to the city, the labor wage rather declines from-18.35 to -64.27 per cent for the urban unskilled and from -0.87 to -4.59 per cent for the urban skilled population. Hence, the wage variation in the labor market is influenced by the rural exodus.

A deplorable main observation is the negative effect of rural exodus on the domestic output and exports of the food crops. The domestic output is dropped down from -1.95 to -21.27 per cent when the rate of rural exodus is increased from 5 to 40 per cent. The exports are also decreased from -6.02 to -44.56 per cent for the same rural-to-city migration rate. This output decrease is mainly attributed to the production elasticity of laborwhich is higher in rural than in urban areas.Hence, labor is more productive in rural areas than in cities and the labor shortage in rural areas tends to significantly influence the domestic output and exports of food crops, generally cultivated in rural areas. However, an increase of the productivity of the rural population is able to offset this decrease in the output and exports of food crops.

RECOMMENDATIONS

Credit Award for Machine Acquisition Could Modernize Rural Farmers' Activities

To compensate the decrease of food crops' domestic output provoked by the rural exodus, the government should encourage the use of agricultural machines and tractors in replacement of human labor force. This could be done by subsidizing agricultural mechanization through the award of subsidized credits to farmers willing to modernize the cultivation of their farms using special equipment imported from developed countries.

The advantage of replacement of machine by human labor force is in terms of quality and quantity of work performed by a machine. It is revealed that some modern machines work five times faster and better than humans. All in all, using machines in replacement of humans would lead to higher crop yields as already experienced in most developed countries. Hence, it would be better for Cameroonian authorities to copy this good experience.

Improvement of Living Standard of Rural Farmers Could Increase Agricultural Productivity

Still, to prevent a drop in the output of food crops due to the rural-to-city migration of villagers, the government should improve the living and health conditions of rural farmers. This can be done by implementing a well improved social security system (currently inexistent) which would enable a regular medical check-up of farmers, by subscribing each farmer to a medical health insurance for risky agricultural activities or by providing retirement benefits which arestill lacking to Cameroonian farmers. Doing that could lead to increase their motivation which in its turn also leads to an increase of their productivity.

Rural Activities Should be Paid at Higher Rate

As stated in the introduction, the wage rate of 1500 FCFA (2.29 Euros) per man-day currently paid to Cameroonian farmers residing in rural areas is very low as compared to the industrial or service sector at the city where the same amount is paid per man-hour of job. Hence, in order to motivate young farmers to stay in the villages and discourage them to migrate to the city, the salary should be adjusted at the same rate (or even higher rate) in the rural farming sector as in the industrial and sector services at the city.

Land Reform Could Enable Young Farmers to Own Land for Settling Down in Rural Areas

The farmers with little land size in villages cannot count on their farming activities to fully satisfy the current family needs such as surviving, going to hospitals for treatment, paying school fees for children, tax money, improvement of living conditions, etc. Thus, their attempt to migrate to the city is high because they want to compensate the financial gap from the insufficient food crop production they obtained from their small parcel in the village. Hence, a land reform which gives larger parcels of land to young farmers or which could oblige those who pos-

sess uncultivated land to regularly hire it to young farmers can help to lower the rural exodus rate. We therefore encourage the government to include the land reform policy in its agenda.

Subsidy onMineral Fertilizer's Price Could Encourage Young People to Invest in Farming Activities

At the present time, farmers are paying a Value Added Tax (VAT) on the purchase of mineral fertilizer which is the main input used for food cropproduction. Since 41 per cent of these farmers live below the poverty line, they currently face serious difficulties to buy fertilizer which was however highly subsidized (at about 65 per cent) by the government during the period 1960-1990 preceding the liberalization. Hence, we recommend the government to remove the VAT tax on the market price of this input and subsidize it as before to make its price more affordable to all farmers' categories. This would better encourage more young farmers to remain in the farming sector in the rural areas.

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